Lagrangian Floats for Cblast

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LONG-TERM GOALS

I seek to understand the dynamics of the ocean boundary layer beneath hurricanes and the fluxes which drive it with the goal of improving ocean models at high wind speed.

OBJECTIVES

To measure turbulence properties and fluxes in the ocean boundary layer beneath hurricanes as and relate them to hurricane properties and fluxes measured by others.

APPROACH

Neutrally buoyant Lagrangian floats will be air-deployed into hurricanes starting the the summer of 2002. The float motion measure water parcel trajectories. High frequency measurements along the float trajectories measure the fluxes and mixing dynamics.

During the last decade, we have developed a new type of neutrally buoyant float (see picture[1]) designed to be used in energetic turbulent flows such as those found in the top and bottom boundary layers of the ocean. A combination of accurate ballasting, compressibility matched to that of seawater and high drag is used to make these floats follow the motion of water parcels accurately (D'Asaro et. al 1976). Water velocity is inferred from the motion of the floats; high frequency fluctuations in velocity can be used to infer mixing rates (Lien et. al 1998).

A new variety of these floats will be used. These has been recently developed using support from NSF, tested during measurements in 1999 in the North Pacific and during 2000 and 2001 off Oregon. These can operate both as Lagrangian floats, by varying their buoyancy to become neutrally buoyant and opening their cloth drogue to create a large drag and as vertical profilers, by folding the drogue and varying their buoyancy to profile up or down. They measure temperature and salinity of the water surrounding them using CTD's mounted on both the top and bottom of the float. The CTD's are also used to control the float's buoyancy so that the float remains neutrally buoyant as the density of the mixed layer changes. The CBLAST floats will carry a Doppler sonar for measuring shear and ambient noise for measuring wind, rain and bubbles. These floats will be supplemented by additional NSF funded floats carrying gas sensors and designed to measure gas flux.

[1] The float is a yellow cylinder, about 1 m long, with instruments on top and bottom and an orange cloth cylindrical drogue at the center.

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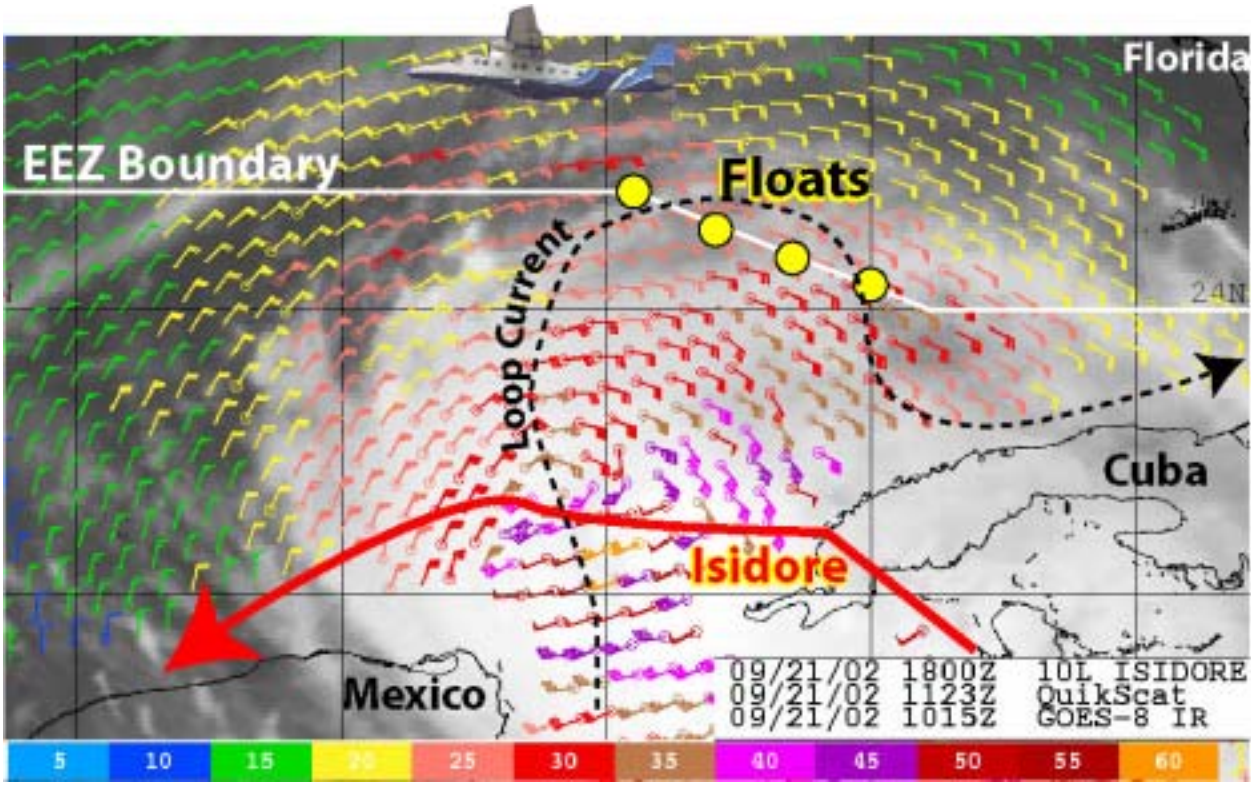

Figure 1. Deployment of floats near Hurricane Isidore. Deployments were made based on forecast track of hurricane, but heavily constrained by the requirement that we not enter the Cuban or Mexican EEZ. Unfortunately, the storm turned strongly westward and the floats were subject to only gale force winds as shown by the QuikScat wind map.

WORK COMPLETED

Figure 1 shows the float deployments near Hurricane Isidore. These were heavily constrained by our inability to get diplomatic clearance from Mexico or Cuba to deploy in their EEZ. The floats were deployed along the EEZ line, which would have resulted in near-hurricane force winds had the storm continued along its track. However, it veered sharply to the west. Fortunately, Isidore was sufficiently strong and long-lived to generate 20-40 kt knot winds and much rain in the deployment region for many days. We anticipate an interesting analysis of upper ocean storm response, but not with hurricane force winds. The mission will ended on September 29 and three of the four floats were located in the Gulf Stream heading past Florida. It does not look good for the fourth float. The floats will be recovered on a cruise in late October, 2002.

RESULTS

We have no CBLAST results as we have no data yet.

IMPACT/APPLICATIONS

None (Yet)

TRANSITIONS

None

RELATED PROJECTS

These floats are nearly identical to those used in studies of circulation and mixing off Oregon.